

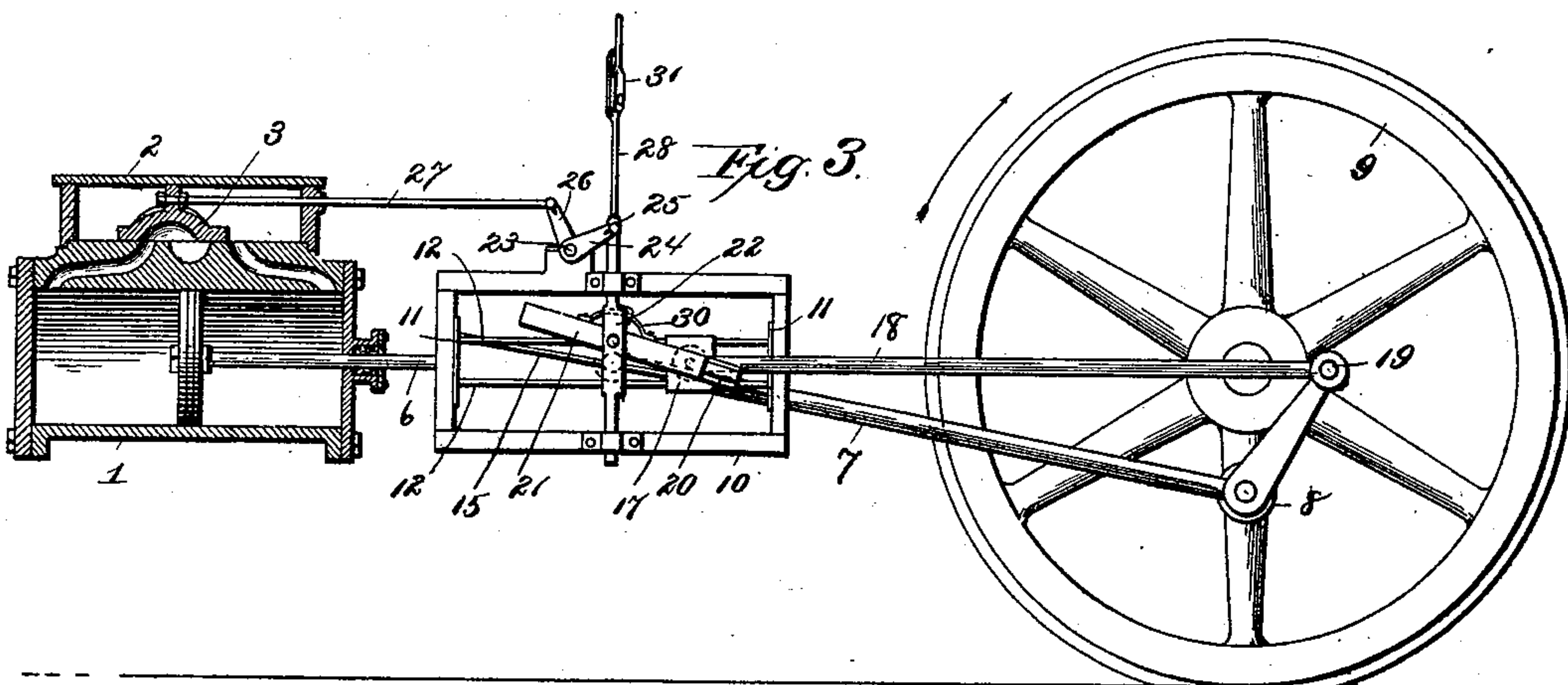
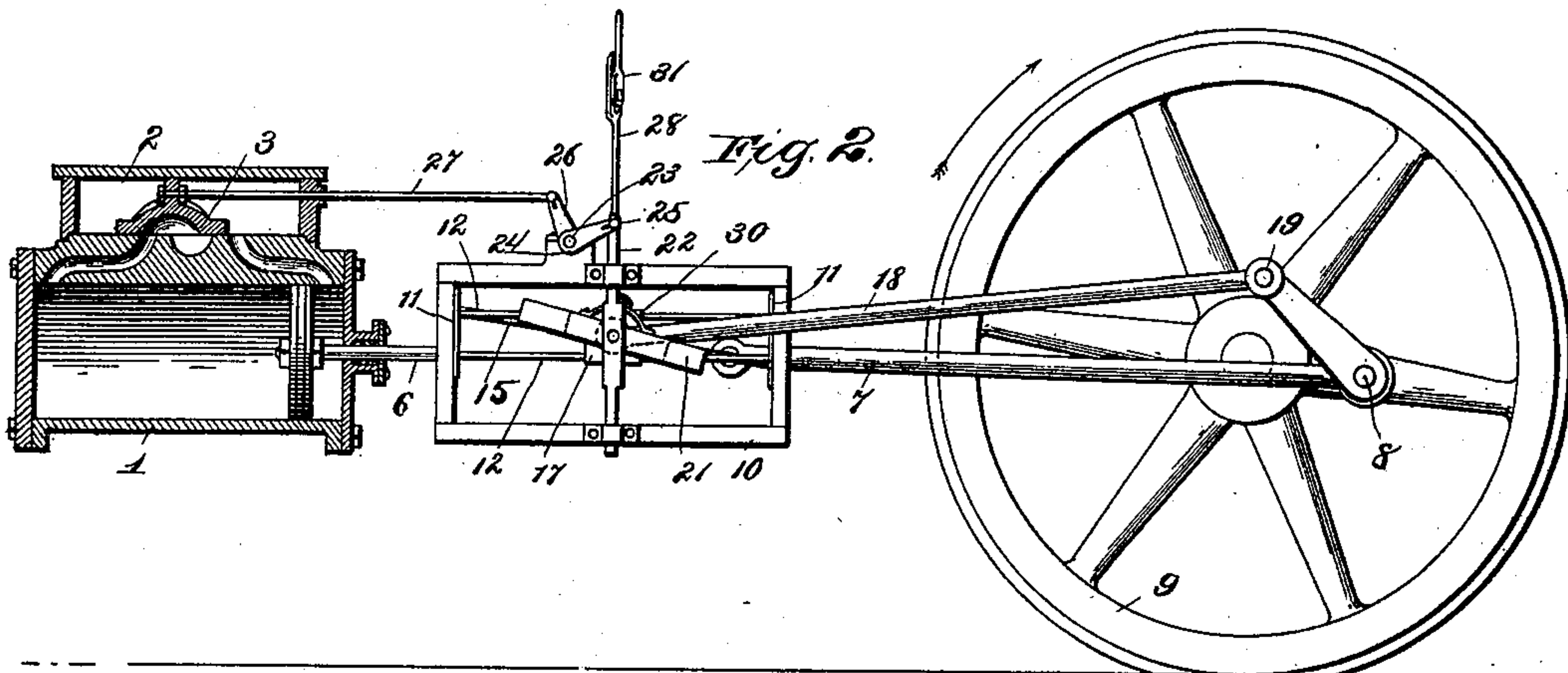
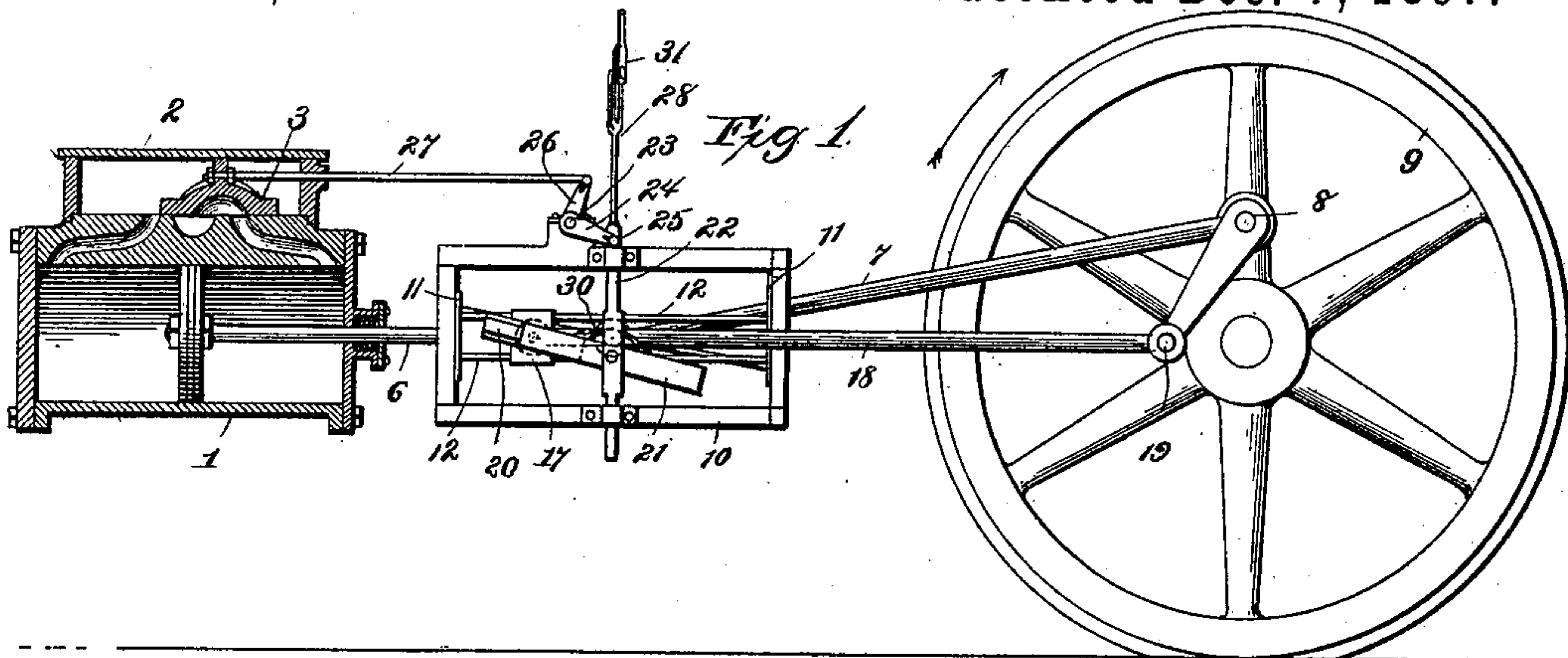
(No Model.)

3 Sheets—Sheet 1.

J. D. HOOD.
VALVE GEAR.

No. 594,951.

Patented Dec. 7, 1897.



WITNESSES

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(No Model.)

3 Sheets—Sheet 2.

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Fig. 4.

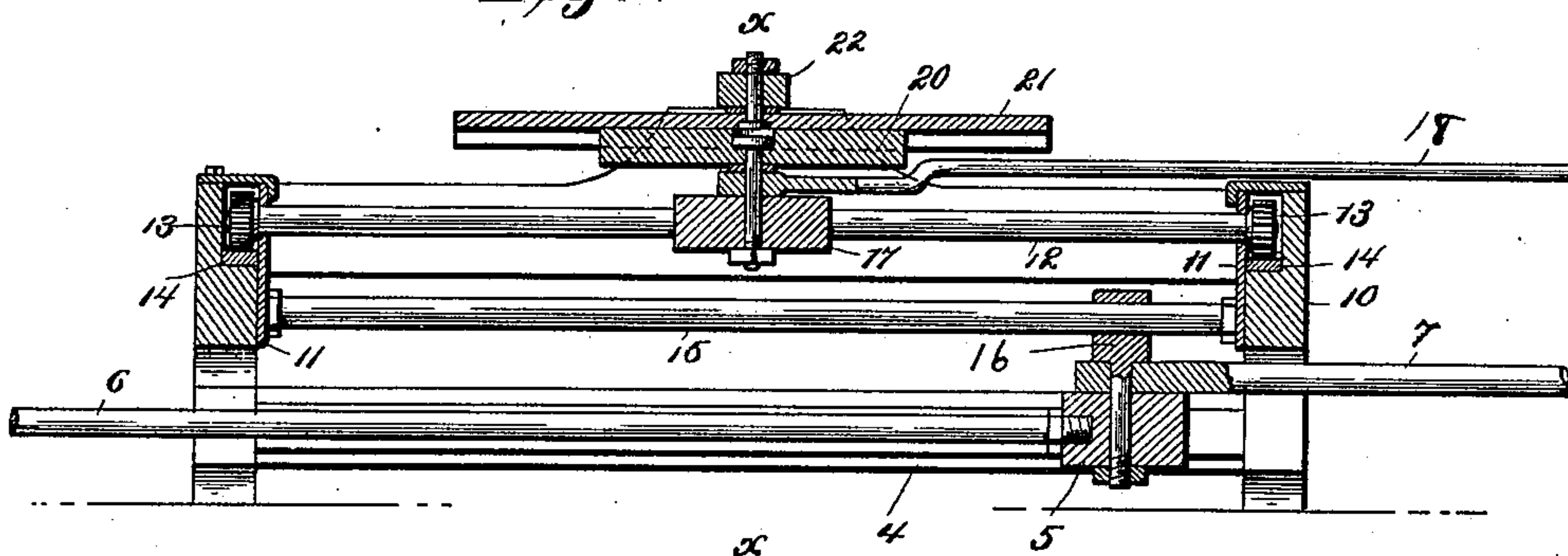


Fig. 5.

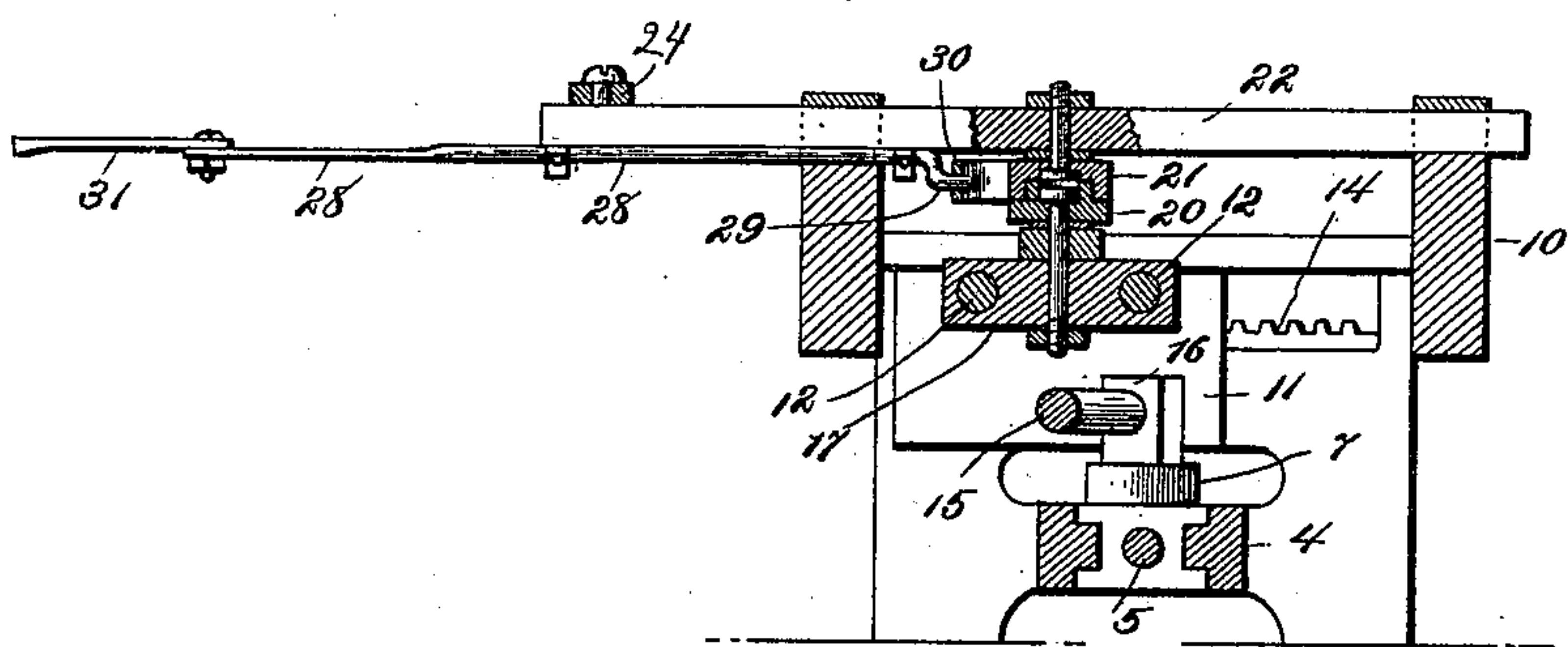
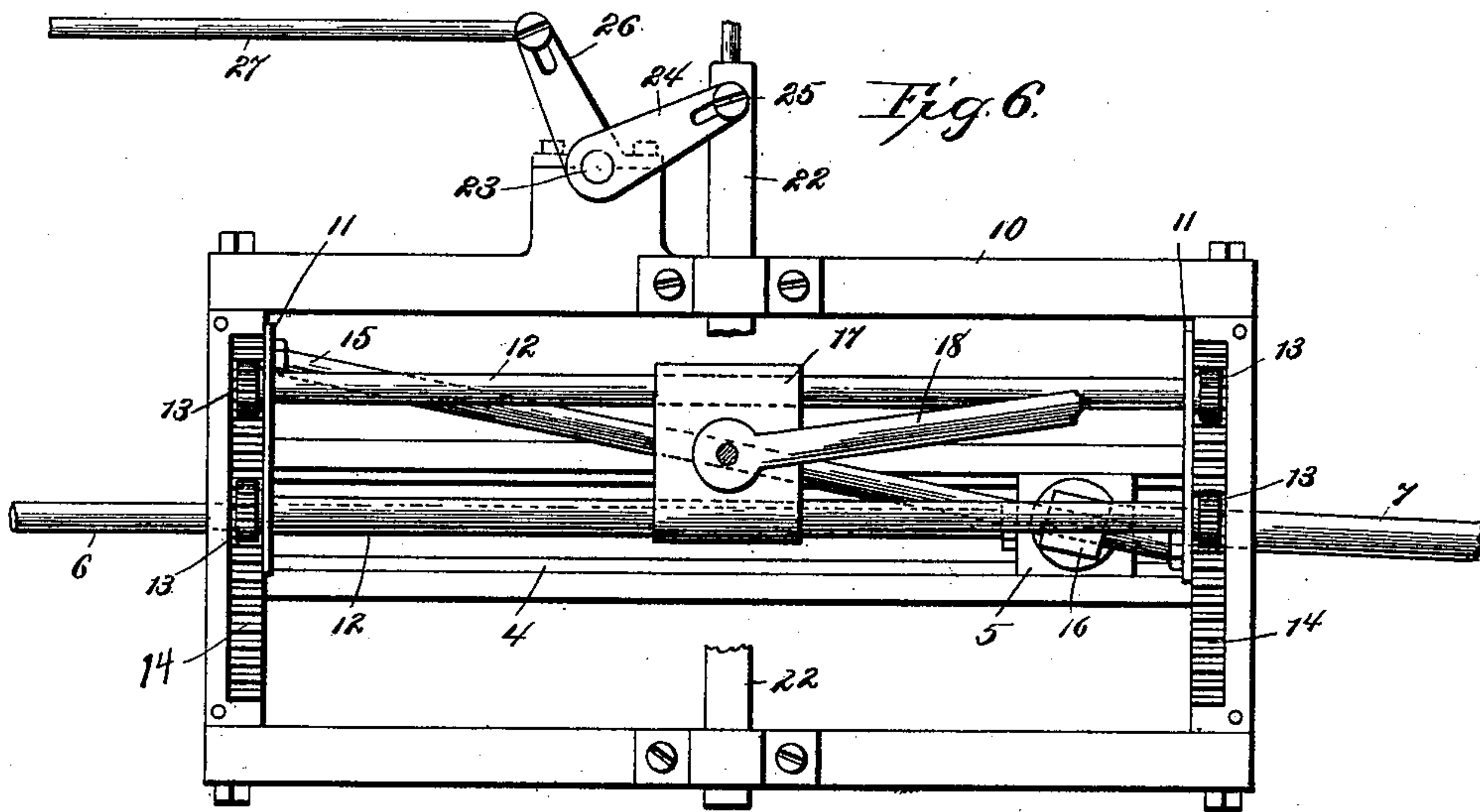


Fig. 6.



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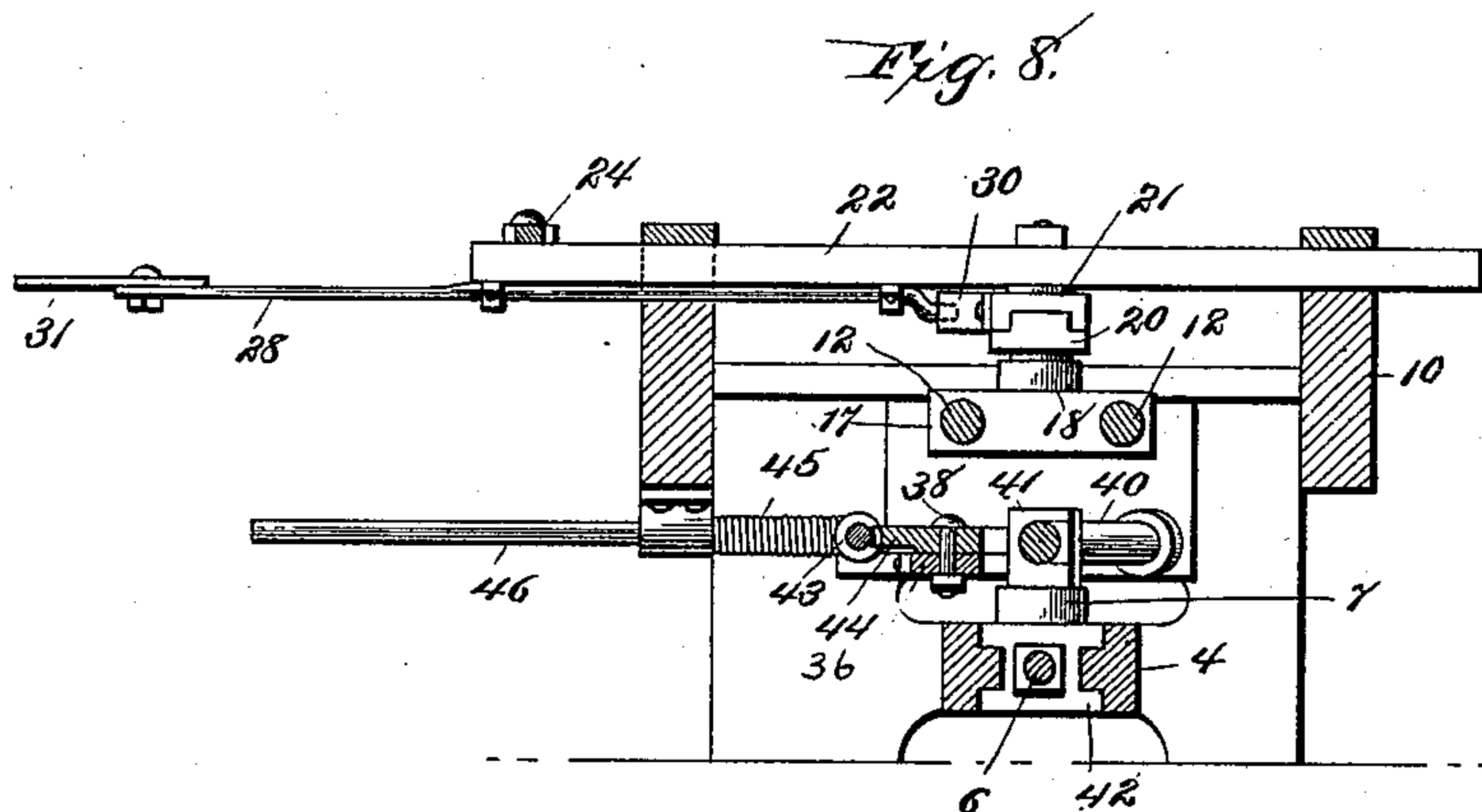
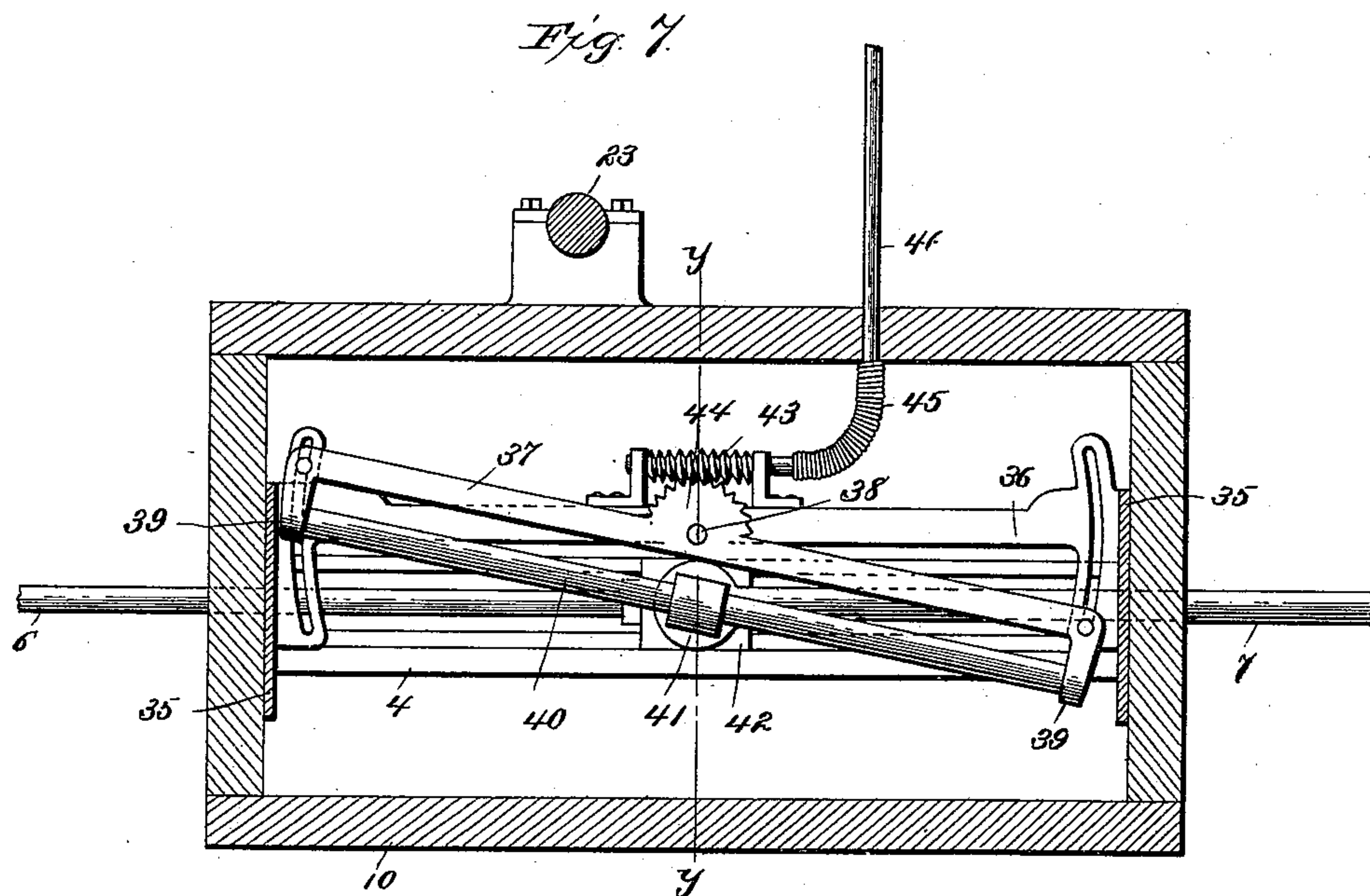
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3 Sheets—Sheet 3.

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UNITED STATES PATENT OFFICE.

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TO SAMUEL J. BAILY, OF SAME PLACE.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 594,951, dated December 7, 1897.

Application filed October 23, 1896. Serial No. 609,787. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. HOOD, a citizen of the United States, residing at Columbia, in the county of Lancaster and State of Pennsylvania, have invented a certain new and useful Improvement in Valve-Gears, of which the following is a specification.

My invention relates to a new and useful improvement in valve-gears for locomotives and the like, and has for its object to provide a simple and effective device by means of which the proper motions may be imparted to a slide-valve to cause the engine to run in either direction without the use of the ordinary link-motion, which necessitates the use of two eccentrics for each valve; and a further object of my invention is to increase the speed of the valve-motion at the ends thereof, so as to prevent the wiring of the steam through the ports, thus increasing the efficiency of the steam used in producing mechanical power therefrom.

With these ends in view this invention consists in the details of construction and combination of elements hereinafter set forth and then specifically designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, its construction and operation will now be described in detail, referring to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a section of a cylinder and steam-chest, showing my improvement adapted to the cross-head of the piston-rod and connected to the valve-stem, the valve being at the forward end of its stroke, while the piston is continuing its movement in the reverse direction; Fig. 2, a similar view, the valve being represented at the rear limit of its stroke, while the piston has just started rearward; Fig. 3, a similar view showing the valve in substantially the same position, while the piston has traveled through one-half of its stroke; Fig. 4, a central longitudinal section of the cross-head and guideways; Fig. 5, a section at the line *x x* of Fig. 4; Fig. 6, an enlarged elevation of the cross-head and guides and parts carried thereby, a portion of the reciprocating valve-bar being broken away; Fig. 7, a slight modification of the lead-guide, in

which the latter is made adjustable and put under control of the engineer in order that the lead of the valve may be varied when desired; Fig. 8, a section at the line *y y* of Fig. 7.

In carrying out my invention as here embodied, 1 represents the cylinder, which may be of any convenient or well-known construction, having mounted thereon the chest 2, in which is seated the slide-valve 3, arranged to open and close the ports in the well-known manner. The guide 4 is adapted to receive the cross-head 5, which is attached to the piston-rod 6 and permits the same to move back and forth with said rod when the latter is actuated by the piston. The pitman 7 connects the cross-head with the crank-pin 8, projecting from the drive-wheel 9. This portion of the device may be of any suitable design, and its operations are those of the ordinary steam-engine. A rectangular frame 10 surrounds the guideways and has fitted thereto, so as to slide vertically, the plates 11, in which are journaled the rods 12, having upon their ends the pinions 13, which mesh with racks 14, supported upon the rectangular frame. When the plates are moved up and down, the action of the pinions upon the racks will cause the rods 12 to revolve upon their axes, which will maintain them in parallelism for the purpose next explained. Between the plates 11 extends a rod 15, set diagonally and having its ends secured to said plates, and this rod passes through a suitable hole in the stud 16, which latter projects outward from the cross-head. By this arrangement it will be seen that as the cross-head moves to and fro it will so act upon the diagonal rod as to cause the plates to which said rod is connected to move up and down, thus carrying the guide-rods 12. Upon these guide-rods is fitted a block 17, so as to slide to and fro thereon, and this block is connected by the rod 18 to the subcrank 19, in order that when the drive-wheel revolves it will give to the block a horizontal reciprocating motion, as well as the vertical motion, which said block receives from the diagonal rod, as just described. A tongued slipper 20 is pivoted to the block 17 and has fitted thereto the grooved block 21, which latter is pivoted to the valve-post 22, said post being held in guides, so as to be

free to move vertically when operated upon, and vertical movements may be imparted to this post by swinging the block 21 at an angle to the line of travel of the slipper, as when thus inclined said slipper in moving to and fro will elevate or lower the post in proportion to the deflection of the block, as will be readily understood.

A rock-shaft 23 is journaled in a suitable bearing upon the rectangular frame and is connected by an arm 24 to the post at 25 and by an arm 26 to the valve-stem 27, in order that when the post is raised and lowered the valve will be given the proper amount of movement upon its seat.

From the foregoing description the operation of my improvement will be obviously as follows:

Assuming that the block 21 is set at the proper angle to cause the engine to run in the direction of the arrow when the block 17 is at the limit of its inward movement, as shown in Fig. 1, the block 21 will be in its lowest position, which will draw down the post in such manner as to bring the valve to the limit of its forward movement. In this position steam will be admitted to the rear end of the cylinder, causing the piston to move forward and revolve the drive-wheel, and as the rod 18 from this point onward will draw the block 17 forward it follows that the block 21 would be moved upward if no other movement were imparted thereto; but it is also obvious that this continued movement of the pitman will draw the stud 16 forward at a greater rate of speed through the first portion of its next immediate movement than will the rod 18 draw the block 17, and, as before described, the movement of the stud 16 will so act upon the oblique rod 15 as to cause it to move upward, and with it the plates 11 and guide-rods 12, from which it will be seen that these two movements will be compounded in the same direction, thereby greatly accelerating the upward movement of the valve-post and causing the valve to shoot across the ports at a high rate of speed until assuming a position at the limit of the reverse end of its stroke by the time the rod 18 reaches the position shown in Fig. 2, at which point the slipper 20 will have reached the center of its movement. Now the steam will be admitted through the forward port to the forward end of the cylinder with the usual effect of forcing the piston rearward, which will continue the rotation of the drive-wheel in the same direction, but will cause the pitman to start upon its rearward movement, and as the cross-head 5 moves backward the oblique guide-rod 15 will be drawn downward, thus drawing downward the guide-rods 12, which would also draw the valve-post downward if no other movement were imparted to the block 21; but during the movement of the pitman from its forward limit through the next ninety degrees the rod 18 will be traveling from the position shown in Fig. 2 to the limit of its forward movement, (shown in Fig.

3,) thereby drawing the block 17 forward, which, as before described, will force the block 21 upward, and this upward movement of the block is equal to the downward movement of the guide-rods 12 and in the same time, so that the valve-post will be left stationary, and consequently the valve will remain in the position shown in Figs. 2 and 3 through these last-described movements of the pitman and connecting-rod. Any further revolving of the drive-wheel from the position shown in Fig. 3 will cause both the cross-head 5 and the block 17 to move rearward, thereby compounding the downward movement of both the guide-rods 12 and the block 21, as before described, which will give to the valve-post an accelerated downward movement, thus causing the valve to travel the complete length of its stroke during the time occupied by the pitman in passing from the position shown in Fig. 3 to its inner dead-center. When the valve is in this position, steam will be again admitted to the rear end of the cylinder for the continuation of the operations of the engine.

From the preceding it will be seen that any amount of lead may be given to the valve by the angle at which the oblique rod 15 is set, since were said rod brought to a horizontal no vertical movement would be given to the guide-rods 12, and therefore the valve would at all times move in perfect unison with the movements of the connecting-rod 18, which, as is well known, would cause a wiring of the steam at both ends of the stroke.

The above-described movement of the valve will readily be understood when it is considered that the pitman 7 and connecting-rod 18 impart motion to the valve-post 22 independent of each other, and that they produce like results when moving in like directions—that is, when either moves to the left it tends to force the valve-post downward. Now if they were both connected to the drive-wheel on the same radius they would always act together and combine their effects on the valve-post to give the valve a continuous motion, but the connecting-rod is ninety degrees behind the pitman, so that they act together in one direction during one quarter-revolution of the drive-wheel, oppose each other during the next quarter-revolution, act together in the opposite direction during the third quarter-revolution, and oppose each other during the last quarter-revolution of the drive-wheel. Thus they combine their action in the first period to throw the valve from one extreme to the other, they neutralize each other in the second period, and in the fourth period they again neutralize each other to let the valve remain at rest.

Fig. 1 illustrates the position of the parts at the beginning of the first period, Fig. 2 the beginning of the second, and Fig. 3 the beginning of the third period.

In reversing an engine it is necessary to throw the valve movement ahead of or behind the movements of the piston, and this

is usually accomplished by two eccentrics connected to a link which is so connected to the valve as to cause one or the other of the eccentrics to actuate said valve, but I accomplish this result by pivoting the block 21 to the valve-post and providing for a change in its angle by the rod 28, which latter is secured to the rear side of the valve-post in such manner as to be turned upon its axis, and the lower end thereof is cranked at 29 and projects into the strap 30, so that when the rod is turned the crank will move the block 21 to the desired angle, where it will be held by this crank, since the rod is prevented from turning by a slip-joint 31, from which leads a suitable lever for the operation thereof, and this last-named lever may pass to the cab of the locomotive in easy reach of the engineer, and would therefore take the place of the reversing-lever. By this arrangement the reversing-block 21 may be not only swung from an angle upon one side of the horizontal to a similar angle upon the opposite side of the horizontal to bring about the reversing of the engine, but the angle at which it may stand to the horizontal may be varied or it may be even brought to a horizontal position, in which case the valve would be held upon its dead-center and prevented from moving in either direction, with the exception of the slight lead movement given by the oblique guide-rod.

The fact that the reversing-block 21 may be brought nearer to or removed farther from the horizontal permits the regulation of the movements of the valve, so as to cause it to cut off at various points in its stroke in the same manner as that occasioned by the throwing of the valve movement partly upon both eccentrics.

In the modification shown in Figs. 7 and 8 I have provided for the varying of the lead of the valve and put this variance under the control of the engineer by the following construction: 35 represents plates fitted to the rectangular frame similar to the plates 11 in the above-described construction, and with these plates is formed a frame 36, to which is pivoted the lever 37 at 38. From the lever 37 project downward the lugs 39, in which is secured the guide-rod 40, the latter passing through the stud 41 upon the cross-head 42. This arrangement will give a vertical reciprocation to the frame 36 by the action of the cross-head upon the rod 40 when in an oblique position, and the angle of this rod may be varied to increase or decrease this vertical reciprocation by the worm 43 meshing with the worm-segment 44, formed upon the lever 37, so that when it is desired to increase or decrease the lead of the valve the worm is revolved sufficiently to set the lever 37 at the proper angle to bring about the desired movement, and when this rod is brought to a horizontal position it is obvious that no movement will be imparted thereto, and therefore no

lead given to the valve. The worm 43 is connected by a flexible shaft 45 to a rod 46, which leads to the cab of the locomotive, and therefore puts the lead of the valve under the control of the engineer.

I am aware that slight modifications might be made in the design here shown—as, for instance, the connecting-rod 18 may receive its movement from an eccentric—and I therefore do not wish to be limited to the exact construction here shown, since my invention rests in the broad idea of actuating the valve of a reversing-engine from a single connecting-rod, thereby obviating the use of two eccentrics and the attendant link-movement.

Having thus fully described my invention, what I claim as new and useful is—

1. In a valve mechanism, slidable guide-rods, an oblique rod connected thereto, a stud carried by the cross-head and slidable on the oblique rod, a block guided on the guide-rods, a slipper secured on said block, means for sliding the block, a slipper-block fitted on the slipper, a post carrying said slipper-block, and means for transmitting the motion of the post to the valve.

2. A valve mechanism, consisting of a slipper guided parallel with the movements of the cross-head, a connecting-rod for moving said slipper, a block fitted to the slipper, a post to which said block is pivoted, said post being so guided as to receive vertical reciprocations from the block, means for turning the block to any angle within certain limits, and means for transmitting the motions of the post to the valve, as specified.

3. A valve mechanism, consisting of guide-rods adapted to move vertically, an oblique rod connected to the first-named rods and so connected to the cross-head as to receive a vertical reciprocation therefrom, a block guided upon the first-named rods, a slipper pivoted to said block, means for imparting longitudinal reciprocations to the block, a block 21 fitted to the slipper, a post to which said block is pivoted, a crank-rod so arranged as to determine the angle at which the last-named block shall stand, and a rock-shaft through which the motions of the post are transmitted to the valve, substantially as and for the purpose set forth.

4. In combination with a valve, a rock-shaft connected thereto by a stem, a post pivoted to one arm of the rock-shaft, a reversing-block pivoted to the post, a crank-rod attached to the post and adapted to turn and hold the block at any desired angle, a slipper fitted to said block, said slipper being pivoted to a slide-block 17, guide-rods upon which the last-named block slides, plates in which said rods are journaled, pinions secured upon the ends of the rods, rack-bars with which said pinions mesh, an oblique rod secured between the plates, a stud through which said rod passes, said stud being carried by the cross-head, and a connecting-rod 18 for imparting

longitudinal reciprocations to the block 17, all arranged substantially as and for the purpose set forth.

5. In combination with a valve mechanism 5 of the character described, a frame 36 arranged to slide vertically, a lever 37 pivoted thereto, a rod 40 carried by the lever, a stud 41 projecting from the cross-head and through which the rod 40 passes, a segmental worm-wheel 10 formed with the lever, a worm meshing with said wheel, and means for revolving the worm, substantially as and for the purpose set forth.

6. In a device of the character described, 15 a frame, a guide thereon, a cross-head slidable on the guide, a second frame slidable in the first frame, a rod on the second frame at an angle to the guide, a stud on the cross-head slidable on said rod and means connected

with the second frame to operate a valve, as 20 and for the purpose described.

7. In a device of the character described, a guide, a block slidable thereon, means for operating the block, a slipper pivoted to the block, a slipper-block slidable on the slipper, 25 a valve-post to which the slipper-block is pivoted, a crank-rod journaled on the valve-post and connected to the slipper-block and means for turning the crank-rod to adjust the position of the slipper-block, substantially as 30 described.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

JOHN D. HOOD.

Witnesses:

S. S. WILLIAMSON,
C. HERSHEY.